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A TAXONOMIC REVIEW OF *CYSTEODEMUS* LeCONTE, *PHODAGA* LeCONTE AND *PLEUROPASTA* WELLMAN (COLEOPTERA: MELOIDAE: EUPOMPHINA) WITH A NEW GENERIC SYNONYMY

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Abstract.—Three small genera of southwestern North American Meloidae, *Cysteodemus, Phodaga* and *Pleuropasta,* are reviewed. *Negalius* Casey is treated as a synonym of *Phodaga* (New Synonymy). Included are generic and species synonymies, species diagnoses, and a summary of the seasonal and geographic distribution of all species.

The subtribe Eupomphina includes seven small but highly distinctive genera of meloid beetles from the arid regions of southwestern North America. Four of these, *Megetra* LeC., *Cordylospasta* Horn, *Tegrodera* LeC. and *Eupompha* LeC. have recently been revised (Selander, 1965; Pinto, 1972a, 1975, 1979). In preparation for a generic classification of the subtribe, a review of the remaining genera, *Cysteodemus, Phodaga* and *Pleuropasta,* is presented here. There are no particular difficulties with these genera and the only taxonomic modification proposed is the synonymy of *Phodaga* and *Negalius.* However, this paper does provide the first opportunity to summarize the geographic and seasonal distribution of all species, and to present generic and species synonymies as well as pertinent diagnoses. Comments on intergeneric relationships will be deferred.

The genera treated here each contain two species. All are confined to desert areas. *Cysteodemus* and *Pleuropasta* both have an eastern (Chihuahuan) and a western (Mojave and Sonoran) representative. Congeners are dichopatric (see Figs. 13, 15). In *Pleuropasta* and *Cysteodemus,* adult activity is correlated with the period of maximum precipitation. Thus, western desert species (*Cysteodemus armatus* and *Pleuropasta mirabilis*) occur primarily in spring or early summer; eastern representatives (*C. wislizeni* and *P. reticulata*) are most common from mid-summer to early autumn (see Tables 1–4). *Phodaga* differs in that its species overlap geographically (Fig. 14). The geographic and seasonal distribution of *Phodaga alticeps* is similar to that of *Pleuropasta mirabilis,* and the two are frequently collected together feeding on species of *Coldenia* (Boraginaceae). *Phodaga marmorata,* however, is unique within the Eupomphina in that it ranges continuously from the Chihuahuan to the Sonoran and Mojave deserts. Although wide ranging, its seasonal distribution throughout is typical of Chihuahuan Desert eupomphines (i.e. primarily summer and autumn).

Phodaga alticeps, Pleuropasta mirabilis and *Cysteodemus armatus* do not occur throughout the Sonoran Desert. They are primarily localized in the lower and

drier western section, referred to as the Colorado Desert or Lower Colorado Valley. *P. mirabilis* and *C. armatus* are thus separated from their Chihuahuan Desert congener by ca. 400 km.

Collection data reported below are based on literature records and material examined in numerous museums and private collections. The collections of the California Academy of Sciences, California Department of Food and Agriculture, University of Arizona, and University of California (Berkeley, Davis and Riverside) provided the majority of records.

Cysteodemus LeConte

Cysteodemus LeConte, 1851: 158 (type-species *Cysteodemus armatus* LeConte, herein designated; Wellman (1910b) erroneously listed *C. armatus* as the type-species of *Cysteodemus* by original designation); 1853: 329; 1858: 11; 1859: 126; 1862: 269. LeConte and Horn, 1883: 416. Champion, 1892: 369. Beauregard, 1890: 409, 411. Wellman, 1910a: 215–221, *passim*; 1910b: 391. Van Dyke, 1928: 458. Bradley, 1930: 114. Denier, 1935: 146, 176. Vaurie, 1950: 6, 60. MacSwain, 1956: 21, 24, 35. Kaszab, 1959: 80, 99; 1969: 243. Arnett, 1963: 623–624. Gupta, 1965: 468; 1971: 27. Erickson, 1973: 785. Pinto, 1977a: 389; 1977b: 947–950, *passim*.

Robust, wingless, subglabrous, elytra inflated and connate along suture. Body length varying from 7–18 mm, breadth across elytra ⅔–⅘ body length.

Head with antennal sockets directly above base of lateral margin of clypeus. Eyes broadly emarginate anteriorly, with longitudinal axis directed toward front of head (Fig. 3). Labrum shallowly emarginate. Antennae 11-segmented, subfiliform, uniformly setate, relatively short, only slightly longer than protibiae. Pronotum transverse, much broader than long, angulate or spinose laterally (Figs. 10–12). Elytra strongly reticulate. Legs slender; two subequal spiniform spurs at apex of all tibiae, spurs brown except those of middle and hind legs usually yellowish at apex; tarsal claws with relatively small ventral tooth at base. Abdomen with anterior four terga distinctly less sclerotized than others. Aedeagus with 1 or 2 ventral spines and 1 dorsal spine; posterior ventral spine near apex (Fig. 8).

Remarks.—The inflated and connate elytra separate *Cysteodemus* from all other North American meloids.

Cysteodemus was described by LeConte (1851) for the two species currently included. In 1853 LeConte treated another wingless species, *Meloe cancellatus* Brandt and Erichson, as a *Cysteodemus*, but eventually removed it, placing it in its own genus, *Megetra* (LeConte, 1859).

Adults of *Cysteodemus* were redescribed by Van Dyke (1928). The first instar larvae of both species were described by MacSwain (1956).

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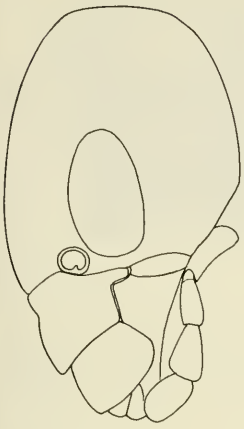
Figs. 1–9. Figs. 1–3. Head (lateral view) of eupomphine genera showing position of eye relative to front. 1, *Phodaga marmorata*. 2, *Pleuropasta mirabilis*. 3, *Cysteodemus armatus*. Figs. 4–5. Head (anterior view) of eupomphine genera showing structure of clypeus and position of antennal sockets relative to lateral clypeal margins. 4, *Phodaga marmorata*. 5, *Cysteodemus armatus*. Figs. 6–9. Aedeagus (lateral view) of eupomphine species. 6, *Pleuropasta reticulata*. 7, *Pleuropasta mirabilis*. 8, *Cysteodemus armatus*. 9, *Phodaga alticeps*.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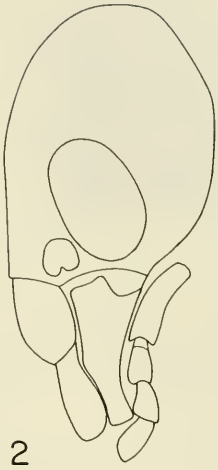
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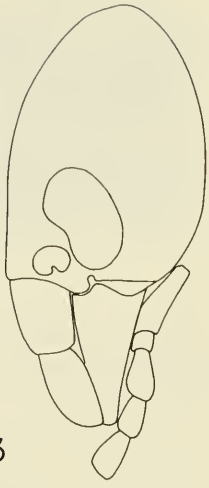
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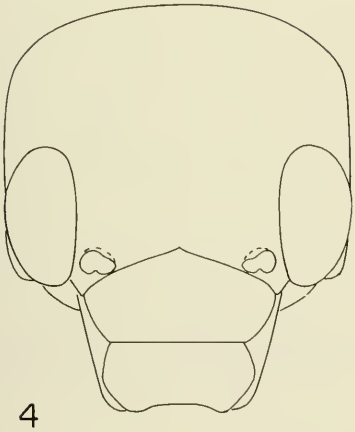
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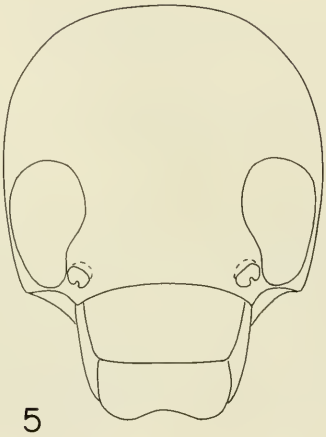
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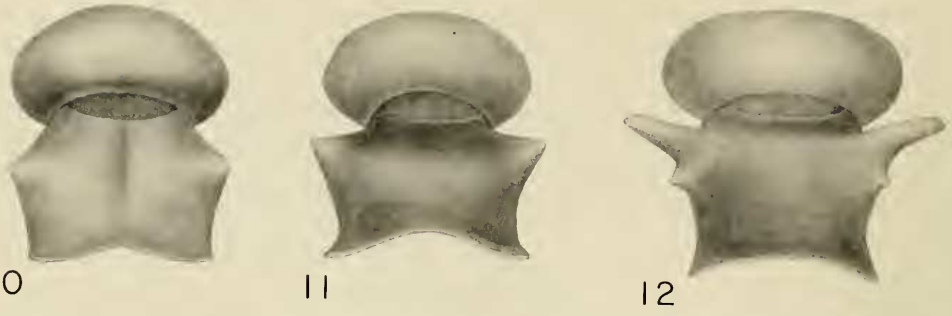

Figs. 10–12. Pronotum of *Cysteodemus* illustrating inter- and intraspecific variation. 10, *C. wislizeni*. 11, *C. armatus* (from Wilsona, Los Angeles Co., CA), an example of poorest development of lateral spines in species. 12, *C. armatus* (from 3.5 mi. NW Glamis, Imperial Co., CA) an example of highest development of lateral spines in species.

Species Diagnoses

Cysteodemus armatus LeConte: Pronotum distinctly spinose laterally (Figs. 11, 12), disc abruptly declivous posteriorly; elytra with relatively large reticula (a line drawn over longest aspect of elytra traverses ca. 20 reticula); legs of both sexes lacking tarsal pads; head moderately coarsely punctate, punctures moderately dense and ill-defined; dorsal coloration black, often with a slight metallic blue, green or violet tint; commonly with white, yellow or yellow-brown incrustation on head, pronotum and elytra. Inhabiting the Colorado and Mojave deserts.

Cysteodemus wislizeni LeConte: Pronotum angulate or, at most, tuberculate laterally, never spinose (Fig. 10), disc only slightly declivous posteriorly; elytra with smaller, more numerous reticula (a line drawn over longest aspect of elytra traverses ca. 30 reticula); legs of male with heavy tarsal pads on segments I and II of pro- and mesotarsi; head with coarse, distinct and dense punctures; dorsal coloration deep metallic blue, green or violet; cuticle shining, lacking an incrustation. Inhabiting the Chihuahuan Desert.

Cysteodemus armatus LeConte

Cysteodemus armatus LeConte, 1851: 158; 1853: 330; 1859: 126. Wellman, 1910b: 391. Van Dyke, 1928: 459. La Rivers, 1938: 124. Gupta, 1965: 451; 1971: 11. Werner et al., 1966: 8, 29. Leppla, 1976: 49. Pinto, 1977a: 389. Cohen and Pinto, 1977: 741. Cohen et al., 1981: 179.

Types.—From California, desert near the Colorado River, in the Museum of Comparative Zoology, Harvard University.

Geographic distribution.—Figure 13. Confined to the Colorado and Mojave deserts. Typically associated with creosote scrub vegetation. *C. armatus* is not known further north than the Panamint and Death valleys in California. Saline and Eureka valleys to the immediate north present a similar habitat, but the species has never been taken there in spite of heavy collecting in both areas in recent years.

Seasonal distribution.—Table 1. 1 February (Seeley, Imperial Co., CA)–29 June (Victorville, San Bernardino Co., CA). Although overlap is considerable, populations in the Colorado Desert (S of 34°N) are significantly earlier than those to the north in the Mojave Desert (N of 34°N) (see Table 1). Unlike *Phodaga alticeps*

Table 1. Seasonal distribution and its geographic variation in *Cysteodemus armatus* with frequencies expressed as semi-monthly percentages of total records.

Area	Semi-monthly intervals[1,3]										Total records[2]
	Feb-A	Feb-B	Mar-A	Mar-B	Apr-A	Apr-B	May-A	May-B	Jun-A	Jun-B	
I. S of 34°N	1	1	6.1	30.6	37.4	16.3	4.8	0	2.0	1	147
II. N of 34°N	0	0	0	8.3	17.9	39.3	25.0	7.1	1.2	1.2	84

[1] (A) following the month refers to records from the 1st to the 15th—(B) to records after the 15th.
[2] A record consists of one or more specimens collected at a locale on a particular date.
[3] In Area I (Colorado Desert) the majority of the records are prior to 15 April; in Area II (Mojave Desert) most are after this date ($\chi^2 = 56.86$; $P < .001$).

and *Pleuropasta mirabilis* (see below), *C. armatus* has never been taken in late summer or in autumn.

Adult hosts.—Adults of *C. armatus* are most commonly found feeding on flowers of creosote (*Larrea tridentata* Cov.; Zygophyllaceae), but frequently eat blooms of other desert plants as well. Other food plants recorded are: *Acamptopappus sphaerocephalum* Gray, *Chaenactis* spp., *Geraea canescens* T. & G., *Palafoxia linearis* (Cav.) (Asteraceae); *Gilia* spp., *Langloisia matthewsii* (Gray) (Polemoniaceae); and *Coldenia* spp. (Boraginaceae).

Creosote bush is a predictable food source for *C. armatus* even in the driest of years. Quantitative data are lacking, but it is my impression that, when available, plants other than creosote are preferred.

Remarks.—The structure of the pronotum is variable in *C. armatus.* Although typically abruptly declivous posteriorly, it is barely so in some. The expression of the pronotal spines also varies (Figs. 11, 12). At an extreme, most common in the southern portion of the range, each spine is elongate, strongly curved apically and accompanied by a smaller spine at its base.

The color of the incrustation covering the dorsal surface of most *C. armatus* varies continuously from white to yellow-brown. All forms are known from all geographic regions. However, the frequency of the color classes may vary geographically. In the Colorado Desert (S of 34°N), 42.6% of the series examined with an incrustation were white to very light yellow (n = 68). Mojave Desert populations (N of 34°N) are more commonly yellow or yellow-brown; only 24.2% of the series examined were white or light yellow (n = 33). A chi-square test on these limited data was not significant at the 5% level. Although this incrustation has not been completely analyzed, preliminary study indicates that it is a nitrogenous secretion (Cohen and Pinto, unpubl.).

Gupta (1971) erroneously characterized this species as having 2 dorsal and 2 ventral spines on the aedeagus. All specimens that I have examined possess but 1 of each.

Records.—MEXICO. BAJA CALIFORNIA NORTE: Cocopah Mts.; Laguna Salada, N end; Los Medanos, 10.3 mi. SW; Palacio, 15 & 20 mi. S; Rio del Mayor, 35 mi. S; San Felipe, & 3, 25, 35, 50 mi. N, and 14, 18 mi. S. SONORA: El Golfo, 6 mi. N & 36 mi. NE. UNITED STATES. ARIZONA: *Pinal Co.* Sacaton. *Maricopa Co.* Gila Bend, 18 mi. S. *Mojave Co.* Alamo Crossing; Bullhead City; Oatman; Topock. *Yuma Co.* Aztec, 2 mi. E; Dateland, 6 mi. N & 20 mi. E; Ehrenberg, & 5 mi. N; Ligurta; Martinez Lake, 1 mi. SE; Mohawk; Parker, & 8 mi. SE; Quartzsite; San Luis; Tinaja Atlas Mts.; Wellton, & 4 mi. E, 15 mi. S;

Yuma, 21 mi. N. CALIFORNIA: *Imperial Co.* Brawley, 15 mi. W; Chocolate Mts.; Fig Tree John's; Glamis, & 7 mi. W, 2 mi. N, 3.5 mi. NW (Algodones Dunes), 10 mi. N; Grays Well; Harpers Well; Holtville, & 5 mi. W; Kane Springs; Niland; Ocotillo, 5 mi. N; Ogilby Rd., 3 mi. S Jct. Hwy. 78; Palo Verde; Plaster City, 15 mi. N; Pinto Wash; Potholes; Seeley, S of; Signal Mtn., at base of; Superstition Mtn.; Winterhaven, 12 & 31 mi. W; Westermoreland, 15 mi. NW. *Inyo Co.* Argus Mts.; Death Valley Jct., 10 mi. S; Death Valley National Monument (Ashford Mill, Furnace Ck., Confidence Mill, Jct. Hwy. 178 & Saratoga Spgs. Rd.); Darwin; Darwin Falls; Little Lake, & 10 mi. S; Panamint Springs, 2 mi. E; Panamint Valley, Jct. Trona & Ballarat Rds.; Shoshone, 15 mi. S; Trona, 14 mi. N, 17 mi. NE; Valley Wells. *Kern Co.* Brown, 5 mi. E; China Lake; El Paso Mts. (Iron Cyn.); Inyokern, & 7 mi. NE; Mojave; Searles Station; Short Cyn.; Ridgecrest; Rosamond. *Los Angeles Co.* Acton; Lancaster; Llano, & 7 mi. S; Lovejoy Buttes; Valyermo, 2 mi. NW; Wilsona. *Riverside Co.* Blythe, & 18 mi. W, 22 mi. W, 8 mi. N; Box Cyn.; Coachella; Cottonwood Spgs.; Desert Center, 5 mi. N, 18 mi. E; Desert Hot Springs; Dos Palmas; Edom, 4 mi. E; Hopkins Well; Indio, & 3 mi. E, 20 mi. E, 22 mi. S; Joshua Tree National Monument (Cholla Gardens, Hidden Valley, SE entrance); Mecca, & 7 mi. E, 10 mi. E, 10 mi. S; McCoy Spgs.; Oasis, 2 mi. S; Painted Cyn.; Palm Cyn.; Palm Desert, 3.5 mi. S (Boyd Desert Reserve); Palm Springs; Rancho Mirage; Shavers Well; Taquitz Cyn.; Thermal; Thousand Palms, & 6 mi. NE; Whitewater. *San Bernardino Co.* Afton; Amboy, 3 mi. E; Amboy Crater; Amboy Lava Flow; Baker; Barstow, & 3 mi. W; Cronise Valley; Daggett; Essex, 18 mi. E; Goffs; Joshua Tree; Jolly's Corner, 4 mi. E (nr. Hesperia); Kelso, 2.5 mi. S; Kramer Hills; Kramer Jct., 2 mi. S; Lobecks Pass; Lucerne Valley; Ludlow; Manix; Morongo Valley, 1 mi. N; Needles; Old Dale, 5.4 mi. NW; Old Woman Springs; Parker Dam; Phelan, 10 mi. E; Providence Mts. (Bonanza Mine); Rice, 3 mi. N; Salt Wells, 7 mi. W; Saratoga Springs; Tecopa, 12 mi. ESE; Twentynine Palms, & 3 mi. N; Victorville; Vidal Junction, 7 mi. N; Westend; Yermo; Yucca Valley, 10 mi. N; Zzyzx Springs, dunes S of. *San Diego Co.* Agua Caliente (Springs); Borrego Valley; Borrego Springs, & 3 mi. E; Coyote Ck., Anza Borrego State Park; Jacumba, 5 mi. E; Ocotillo Wells; Split Mtn. Rd. (nr. Ocotillo Wells); Sweeney Pass; NEVADA: *Clark Co.* Dead Mts.; Glendale, 1.6 mi. E; Logandale; Stump Spring.

Cysteodemus wislizeni LeConte

Cysteodemus wislizeni LeConte, 1851: 158; 1853: 330; 1859: 126; Dugès, 1889: 40. Champion, 1892: 369 (as *wizlizeni,* in error). Van Dyke, 1928: 460. Vaurie, 1950: 60. Selander, 1954: 85. Dillon, 1952: 368. MacSwain, 1956: 36. Pinto, 1977a: 389.

Types.—From New Mexico, in the collection of the Museum of Comparative Zoology, Harvard University.

Geographic distribution.—Figure 13. Within and peripheral to the Chihuahuan Desert, from northern Durango and southern Coahuila, north to northern New Mexico. A single Arizona record from Pima Co., AZ (Oct. 1928), cited by Werner et al. (1966) is the only report of this species west of the Continental Divide. The locale is ca. 200 km from the continuous range of *C. wislizeni.* The record is not mapped in Fig. 13; it should be confirmed by additional collections.

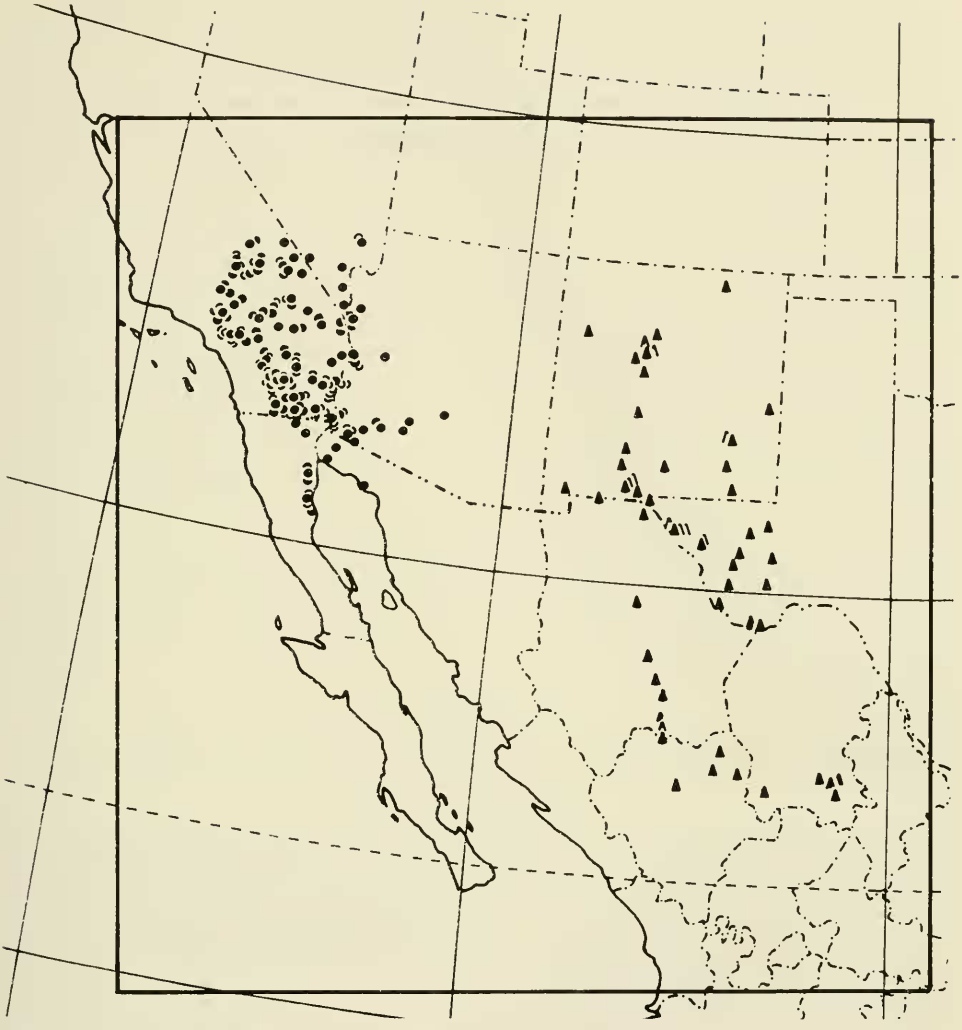

Fig. 13. Geographic distribution of *Cysteodemus armatus* (dots), and *C. wislizeni* (triangles).

Seasonal distribution.—Table 2. 10 March (Presidio, TX)–8 November (70 km. N Saltillo, Coahuila). The records available do not suggest geographic variation in season of adult activity. Adults have been most commonly taken in August in all areas. Collection dates approaching the two extremes of the seasonal range are known from the same locale in different years (e.g. 16 June & 11 September at Fort Hancock, TX; 25 May & 16 August at Loving, NM).

Adult hosts.—Selander (1954) records adults of *C. wislizeni* feeding on *Aster* sp. (Asteraceae), *Tidestromia lanuginosa* (Nutt.) (Amaranthaceae) and *Kallstroemia parviflora* Norton (Zygophyllaceae). Werner et al. record *Solanum eleagnifolium* Cav. (Solanaceae) as a common host, and Pinto (1977a) recorded numerous specimens feeding on flowers of *Gilia longiflora* (Polemoniaceae) and foliage of *Tribulus terrestris* L. (Zygophyllaceae).

Table 2. Seasonal distribution of *Cysteodemus wislizeni* with frequencies expressed as monthly percentages of total records.

Total records	Month								
	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.
65	1.5	4.6	6.2	10.8	13.8	36.9	16.9	7.7	1.5

Records.—MEXICO. CHIHUAHUA: Chihuahua, 30 & 25 mi. S; Ciudad Camargo, 10 mi. N, 42 mi. SW; Delicias; Hidalgo del Parral, 27 mi. E; Samalayuca, 29 km. N; Sueco. COAHUILA: Guadelupe; Saltillo, 70 km. N; San Pedro de las Colonias. DURANGO: Bermejillo, 16 mi. N; Ceballos; La Zarca, 2 mi. SE; Villa Lerdo; Yermo. UNITED STATES. NEW MEXICO: *Bernalillo Co.* Rio Puerco; Albuquerque, 7 mi. NE. *Chaves Co.* Bottomless Lake State Park; Pecos River (near Roswell). *Colfax Co.* Koehler. *Dona Ana Co.* Las Cruces, & 4 mi. E; Mesilla Dam; Mesilla Park, 3 mi. E, 3 mi. S; Jornada Range Reserve (S entrance); Rincon, 6 mi. N. *Eddy Co.* Artesia, S of; Loving. *Grant Co.* County record only. *Luna Co.* Columbus, 1 mi. W. *McKinley Co.* Coolidge. *Otero Co.* Alamogordo, 36 mi. SE. *Roosevelt Co.* Portales. *Sandoval Co.* Bernalillo, 4 mi. N; Coronado; Domingo. *Sierra Co.* Truth or Consequences, 17 km. S. *Socorro Co.* San Antonio, 2 mi. E. *Valencia Co.* Los Lunas. TEXAS: *Brewster Co.* Big Bend National Park (Santa Elena); Castolon; Chisos Mts.; Marathon. *Culberson Co.* Van Horn, & 6 mi. N. *El Paso Co.* El Paso. *Jeff Davis Co.* Davis Mts. *Hudspeth Co.* Finley; Fort Hancock; McNary, 3 mi. SE; Sierra Blanca. *Presidio Co.* Presidio; San Estaban. *Reeves Co.* Balmorhea; Pecos; Toyahvale, 3 mi. S. *Ward Co.* Peyote, 6 mi. N.

Phodaga LeConte

Phodaga LeConte, 1858: 76 (type species, *Phodaga alticeps* LeConte, by monotypy). LeConte and Horn, 1883: 420, 422. Beauregard, 1890: 433. Wellman, 1910a: 215, 221; 1910b: 394. Van Dyke, 1928: 405. Bradley, 1930: 113. Dillon, 1952: 374. MacSwain, 1956: 21, 28. Kaszab, 1959: 80, 99; 1969: 243. Arnett, 1963: 623, 624. Gupta, 1965: 468; 1971: 27. Pinto, 1972b: 459; 1972c: 577; 1977b: 949.

Negalius Casey, 1891: 175 (type species, *Negalius marmoratus* Casey, by monotypy). Wellman, 1910a: 221; 1910b: 394. Van Dyke, 1928: 405. Bradley, 1930: 113. Dillon, 1952: 374, 376. MacSwain, 1956: 21, 29. Kaszab, 1959: 80, 99; 1969: 243. Arnett, 1963: 623, 624. Gupta, 1965: 468; 1971: 27. Pinto, 1972b: 459; 1977b: 949. NEW SYNONYMY.

Elongate to moderately robust, holelytrous, fully winged, cuticle entirely black. Body length varying from 6–25 mm.

Head with antennal sockets dorsomedial to lateral margin of clypeus (Fig. 4). Eyes not noticeably emarginate anteriorly, with long axis subparallel to front of head (Fig. 1). Clypeus with basal suture arcuate or angulate (Fig. 4). Labrum slightly but distinctly concave, emarginate or not. Mandibles usually tridentate at apex. Antennae short, subequal in length to protibia, 11-segmented, segments subquadrate, laterally compressed. Pronotum subquadrate, slightly wider than long, sides subparallel, disc more distinctly convex at basal ½, abruptly declivous to basal margin, bilobed basally. Elytra not strongly reticulate. Legs slender, elon-

gate, each with 2 spurs at apex of tibia, anterior (outer) spur typically shorter, metatibial spurs yellowish in color. Fore and middle legs sexually dimorphic. Protarsi with segment I flanged in male. Aedeagus with 2 small ventral spines, and 1 dorsal spine; posterior ventral spine distinctly subapical (Fig. 9).

Remarks.—Synonymizing *Negalius* with *Phodaga* is clearly justified on phenetic and cladistic grounds (Pinto, MS). As indicated in an earlier paper (Pinto, 1977b), it is primarily the anatomical correlates of courtship behavior that separate the two. Differences in elytral sculpturing, setal coloration and distribution, head shape, and claw structure, also used for separation, are superficial. Considering the apparent recent origin of distinctive courtship displays in the Eupomphina (Pinto, 1977b), the numerous similarities between the two argue convincingly for synonymy at the generic level. The first instar larvae of both are almost identical (MacSwain, 1956), and adults share several derived traits unique within the subtribe. These include the flanged first protarsal segment in males, the more medial position of the antennal sockets (cf. Figs. 4, 5), the typically tridentate mandibles, eye structure (cf. Figs. 1–3), the concave labrum, and the shortened, laterally compressed antennae. Although courtship behavior is different, the use of the middle legs in male display is an additional shared derived trait unique within the Eupomphina (Pinto, 1972, 1977b). According to Gupta (1965) the two species are also distinguishable from other eupomphine genera on the basis of stomodeal anatomy.

Species Diagnoses

Phodaga marmorata (Casey): Elytra obsolescently reticulate with a variegated pattern of cinereous pubescence at floor of reticula; occiput evenly convex; protarsal segment I of male with a ventral flange, lacking a basal fovea; pro- and mesotibia of male normal, not enlarged; mesotarsi of male slightly inflated, subglabrous; mesotibial spurs strongly unequal, length of posterior spur ca. ½ that of anterior spur; antennae not sexually dimorphic; body broadly tumid posteriorly, elytra only moderately declivent laterally, width across elytra increasing posteriorly.

Phodaga alticeps LeConte: Elytra relatively smooth, subglabrous; occiput distinctly acuminate; protarsal segment I of male with both a ventral flange and a deep basal fovea; mesotibia of male inflated, with a deep ventral furrow; mesotarsi of male not inflated; length of posterior mesotibial spur greater than ½ length of anterior spur; antennae sexually dimorphic, segments III–V of male wider and subglabrous anteriorly; body linear, elytra distinctly declivent laterally, width across elytra not increasing posteriorly.

Phodaga marmorata (Casey), New Combination

Negalius marmoratus Casey, 1891: 175. Dillon, 1952: 377. MacSwain, 1956: 29. Gupta, 1965: 453; 1971: 12. Werner et al., 1966: 7, 26. Pinto, 1972b: 459; 1977b: 949. Cohen and Pinto, 1977: 742.

Type information.—2 males, from western Texas, in the collection of the United States National Museum, Washington, D.C.

Geographic distribution.—Fig. 14. Occurs in the Rio Grande Valley from near Albuquerque, NM, south to the Big Bend region of Texas and then west through

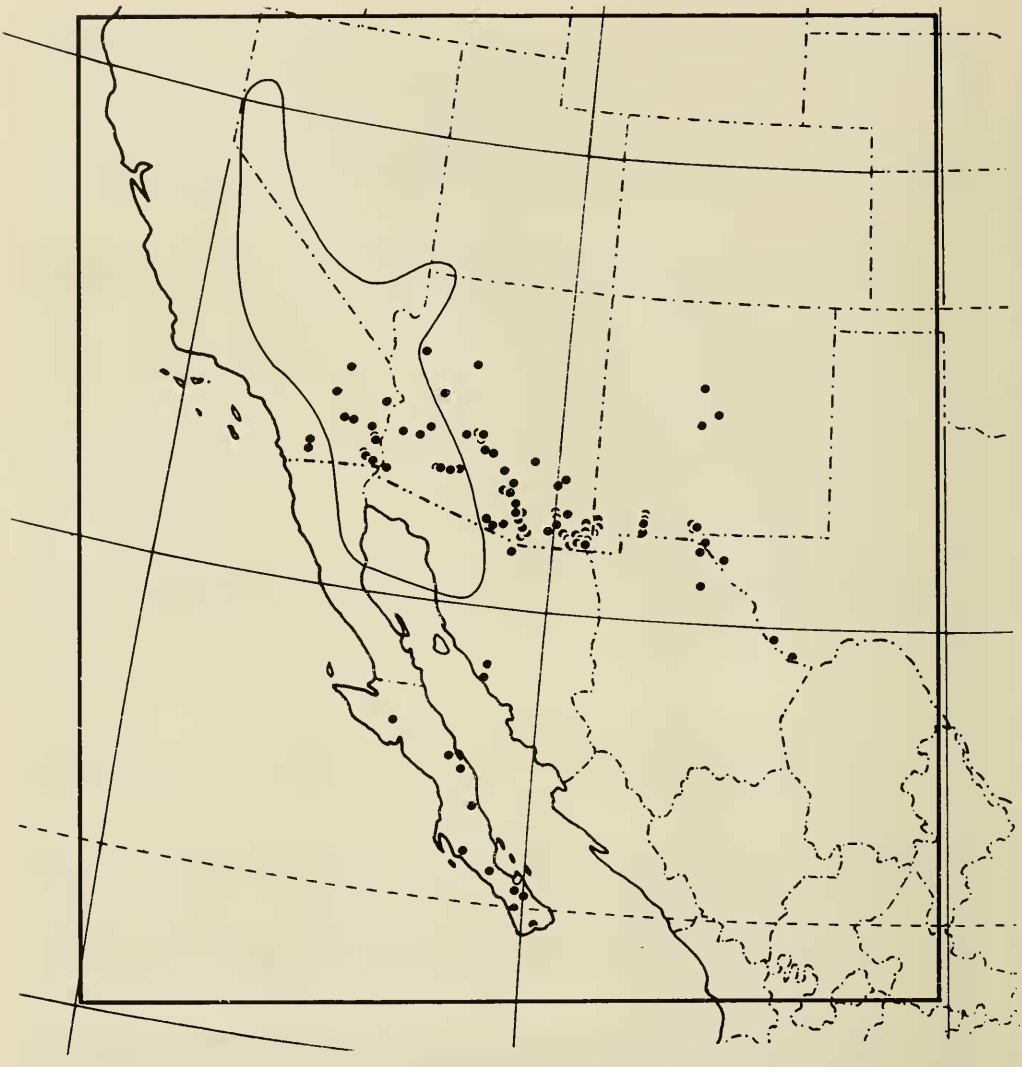

Fig. 14. Geographic distribution of *Phodaga marmorata* (dots), and *P. alticeps* (solid, irregular outline). See Pinto, 1972c for detailed distribution map.

southern Arizona and Sonora to the Colorado and Mojave deserts of California. Also occurring in Baja California Sur; currently unknown from Baja California Norte.

P. marmorata is not as commonly taken in the western portion of its range. This is probably attributable to the less frequent summer rainfall in these regions.

Seasonal distribution.—Table 3. 28 June (El Paso, TX)—17 October (Blythe, CA). Occurs most commonly prior to September in Chihuahuan Desert locales, and in September or later in the Sonoran and Mojave deserts (see Table 3). The seasonal distribution in Baja California Sur is similar to that of populations to the northwest (primarily September).

Adult hosts.—Recorded feeding on flowers and foliage of *Pectis papposa* Harv.

Table 3. Seasonal distribution and its geographic variation in *Phodaga marmorata* with frequencies expressed as monthly percentages of total records.

Area	Month[3]					Total records
	June	Jul.	Aug.	Sept.	Oct.	
Chihuahuan Desert[1]	2.4	9.5	73.8	14.3	0	42
Mojave & Sonoran deserts[2]	0	2.0	28.0	58.0	12.0	50

[1] Locales in New Mexico, Texas, Cochise Co., Arizona, and Chihuahua.
[2] Locales in California, Arizona (except Cochise Co.), Sonora, and Baja California Sur.
[3] More commonly taken before 1 September in the eastern portion of the range; more common after 1 September in the west ($\chi^2 = 28.68$; $P < .001$).

& Gray (Asteraceae), *Kallstroemia grandiflora* Torr. and *Tribulus terrestris* L. (Zygophyllaceae). I have observed large populations of *P. marmorata* feeding on all three species.

Records.—MEXICO: BAJA CALIFORNIA SUR. Guerrero Negro, 57 km SE; La Paz, & 51 km W; Loreto, ca. 35 mi. N, 48 km S; Mulege, 26 km SSE (El Coyote); Pescadero; San Antonio, 7 mi. S; Santa Rita, 9 km SE. CHIHUAHUA. Ojo del Lucero, 5 mi. N; Samalayuca, 29 km N. SONORA. Empalme; Guaymas, 51 km N; Santa Ana, 3 mi. N. UNITED STATES: ARIZONA. *Cochise Co.* Apache, 3.3 mi. S, 5 mi. SE; Douglas, & 10 mi. NW, 17 mi. E; Dos Cabezas; Elfrida; Kansas Settlement; McNeal; Pinery Cyn.; Pearce; Portal, & 2 mi. SE, 4 mi. E; Tex Cyn.; Willcox, & 3 mi. S. *Gila Co.* Globe. *Graham Co.* Bonita; Safford. *Maricopa Co.* Aguila, 12.7 mi. W; Gila Bend, & 1 mi. W, 11 & 20 mi. E; Litchfield Park; Mesa, near; Phoenix; Salt River Indian Reservation; Sentinel, & 5 mi. E. *Mojave Co.* Kingman, 10 mi. E. *Pima Co.* Baboquivari Mts.; Continental, 5 mi. E; Madera Cyn.; Robles Jct., 6 mi. S; Sabino Cyn.; Sells, 5 mi. NW; Tucson, & 2 mi. E, 7 mi. N, 10 mi. S. *Pinal Co.* Florence, & 20 mi. S; Higley; Picacho Pass; Redrock. *Santa Cruz Co.* Atascosa Mts.; Nogales, 12 mi. N. *Yavapai Co.* Ashfork; Santa Maria River, 4 mi. N on Hwy. 93. *Yuma Co.* Quartzsite, 10 mi. E; Salome; Wenden, 2 mi. E; Yuma, 3 mi. N. CALIFORNIA. *Imperial Co.* Indian Wash (on Ogilby Rd.); Glamis, & 3 mi. NW; Palo Verde, & 2 mi. S. *Riverside Co.* Blythe, 20 mi. W; Chiriaco Summit, 5 mi. E; Desert Center. *San Bernardino Co.* Kelso, 20 mi. S (Granite Mts.); Twentynine Palms; Vidal Jct. *San Diego Co.* Anza Borrego State Park, Box Cyn. (ambiguous); San Felipe, W of; Scissors Crossing, & 3 mi. W. NEW MEXICO. *Bernalillo Co.* Albuquerque, 7 mi. NE. *Dona Ana Co.* La Mesa; Las Cruces, 4 & 5 mi. E; Mesilla Park, 3 mi. N; Mesquite. *Grant Co.* Hachita, 17 mi. N. *Luna Co.* Columbus, 1 mi. W; Deming, 20 mi. E, 8 & 14 mi. S. *Hidalgo Co.* Lordsburg; Peloncillo Mts. (Granite Pass); Rodeo, 1, 15, & 18 mi. N. *Socorro Co.* Bernardo, near (as 31 mi. W Mountainair, Torrence Co.). TEXAS. *El Paso Co.* El Paso. *Brewster Co.* Big Bend National Park (Santa Elena Cyn.). *Hudspeth Co.* Finlay. *Presidio Co.* Presidio.

Phodaga alticeps LeConte

Phodaga alticeps LeConte, 1858: 76. Hubbard, 1901: 186. Varley, 1939: 101. Werner et al., 1966: 7, 28. Pinto, 1972b: 459; 1972c: 577; 1977c: 204. Cohen and Pinto, 1977: 741.

The bionomics of *P. alticeps* was covered in earlier papers (Pinto, 1972b, c, 1977c). The species is primarily vernal and occurs in the Colorado Desert, and north through the Mojave Desert to the periphery of the Great Basin. Species of *Coldenia* serve as primary host plants. On one occasion I also found a few individuals feeding on flowers of another Boraginaceae, *Cryptantha micrantha* (Torr.).

P. alticeps is sympatric with *P. marmorata* in the Mojave and Colorado deserts. Since *P. marmorata* occurs in late summer or early autumn in these areas, it is primarily asynchronous to its vernal congener. However, adults of *P. alticeps* do occasionally occur in autumn (Pinto, 1977c), and I am currently aware of one record of both species being collected together at the same locale (20 mi. S Kelso, Granite Mts., San Bernardino, CA; 10 Oct. 1977).

Pleuropasta Wellman

Pleuropasta Wellman, 1909: 20 (type species, *Calospasta mirabilis* Horn, original designation); 1910a: 221; 1910b: 392. Dillon, 1952: 374, 376. Pinto, 1977b: 949.

Pleurospasta: Van Dyke, 1928: 401, 405. Bradley, 1930: 114. Vaurie, 1950: 6, 56. MacSwain, 1956: 21, 25, 30. Kaszab, 1959: 80, 99; 1969: 244. Arnett, 1963: 623, 625. Gupta, 1965: 468; 1971: 27. *Incorrect Subsequent Spelling.*

Small to moderate size, elongate, holelytrous, fully winged, cuticle yellow and brown with black coloration confined to small portions of elytra at most. Body length 6–13 mm.

Head with antennal sockets directly above base of lateral margin of clypeus. Eyes very slightly emarginate anteriorly, with longitudinal axis not quite subparallel to front of head (Fig. 2). Clypeus with basal margin slightly to distinctly arcuate. Labrum shallowly emarginate or not. Antennae 11-segmented, subfiliform, moderately long (ca. 50% longer than the protibiae). Pronotum distinctly constricted at apical ¼, bilobed basally. Elytra with 4 distinct longitudinal costae on disc, yellow with brown to black apical and postmedian bands, each elytron with 1 or more basal spots. Legs elongate, slender, not sexually dimorphic except for degree of tarsal pad development, each with 2 spurs at apex of tibia, anterior (outer) spur slightly but distinctly shorter, metatibial spurs yellowish in color. Aedeagus with 2 small ventral spines, and 1 dorsal spine; posterior ventral spine distinctly subapical (Figs. 6, 7).

Species Diagnoses

Differences between *P. mirabilis* and *P. reticulata* were detailed by Vaurie (1950).

Pleuropasta mirabilis (Horn): Elytral costae distinct to apex, connected by relatively few transverse ribs which are weaker than the longitudinal costae themselves; frons and base of clypeus distinctly convex; basal margin of clypeus arched; male with antennal segment III slightly excavated basally; gonoforceps with lateral lobes straight, subparallel, lobes not noticeably setate apically; aedeagus with dorsal spine slender, elongate (Fig. 7).

Pleuropasta reticulata Van Dyke: Elytral costae anastomosing at postmedial fascia, transverse ribs in area of fascia as strongly developed as longitudinal costae; frons and base of clypeus not distinctly convex; basal margin of clypeus feebly arcuate; male with antennal segment III normal, without basal excavation; gono-

forceps with lateral lobes bowed outward at apex, distinctly setate apically; aedeagus, with dorsal spine short, robust (Fig. 6).

Pleuropasta mirabilis (Horn)

Calospasta mirabilis Horn, 1870: 93; 1891: 100. Champion, 1892: 393 (in part, not incl. Coahuila rec. & Fig.).

Pleuropasta mirabilis: Wellman, 1909: 21; 1910b: 392. Dillon, 1952: 376 (in part, not incl. TX & Mex. recs.). Pinto, 1977b: 939, 949; 1977c: 204.

Pleurospasta mirabilis mirabilis: Van Dyke, 1947: 157.

Pleurospasta mirabilis: Vaurie, 1950: 57. MacSwain, 1956: 31. Kaszab, 1959: 81. Gupta, 1965: 451; 1971: 12. Werner et al., 1966: 27.

Type information.—Holotype from southern Arizona, in the collection of the Museum of Comparative Zoology.

Geographic distribution.—Figure 15. From NW Nevada, south along the western edge of the Great Basin through the Mojave and Colorado deserts to near Mulege in Baja California Sur. The distribution of *P. mirabilis* is similar to that of *Phodaga alticeps*, but the former is more common in the northern portion of the range and extends more than 500 km further south in Baja California.

Seasonal distribution.—Table 4. 13 March (10 mi. W Glamis, CA)–18 November (12 mi. W Glamis, CA). The range of *P. mirabilis* is divided into northern, central and southern portions. Although overlap is substantial, adult activity is generally delayed from south to north. Adults are active more commonly prior to May in the Sonoran Desert (S of 34°N). North of 34°N activity is most common in May or later. It is latest north of the Mojave Desert (N of 30°N) where most of the records are from June and July.

Although primarily a vernal species in the Mojave and Colorado deserts, adults of *P. mirabilis* are infrequently found here during early autumn apparently when summer rains are sufficiently heavy. This asynchrony is also characteristic of *Phodaga alticeps* (Pinto, 1977c).

Adult hosts.—Species of Boraginaceae. Most commonly collected feeding on flowers of *Coldenia palmeri* Gray and *C. plicata* (Torr.). Also taken by P. H. Timberlake on three occasions on species of *Cryptantha* [*C. angustifolia* (Torr.) and *C. barbigera* (Gray)].

Remarks.—Two of the characters listed by Vaurie (1950) as distinguishing *Pleuropasta* species are inadequate. *P. mirabilis* is characterized by lacking all black coloration, and having a pad on foretarsal segment I of males restricted to the apex only. Specimens examined from Baja California Sur are exceptions for both traits. In material from near Mulege and near San Ignacio, the elytra is black rather than brown at the postmedian and apical fascia. The only male from these locales (nr. Mulege) has a wide, complete pad on protarsal segment I. Since the species has not been collected commonly in Baja California, the form of this variation is unknown.

Records.—MEXICO: BAJA CALIFORNIA NORTE. Meling Ranch, 1 mi. E; Rancho Ines, 9 km NW (29°, 46′N, 114°, 46′W); San Felipe, & 14 mi. S. BAJA CALIFORNIA SUR. Mulege, 19 km. NW; San Ignacio, 39 km W. SONORA. El Golfo, 36 mi. SE. UNITED STATES: ARIZONA. *Maricopa Co.* Gila Bend, & 17 mi. S; Paradise Valley; Phoenix. *Mojave Co.* Oatman. *Pima.* Ajo; Tucson (Pantano Wash); Tucson, 8–12 mi. N. *Pinal Co.* Florence Jct.; Picacho. *Yuma*

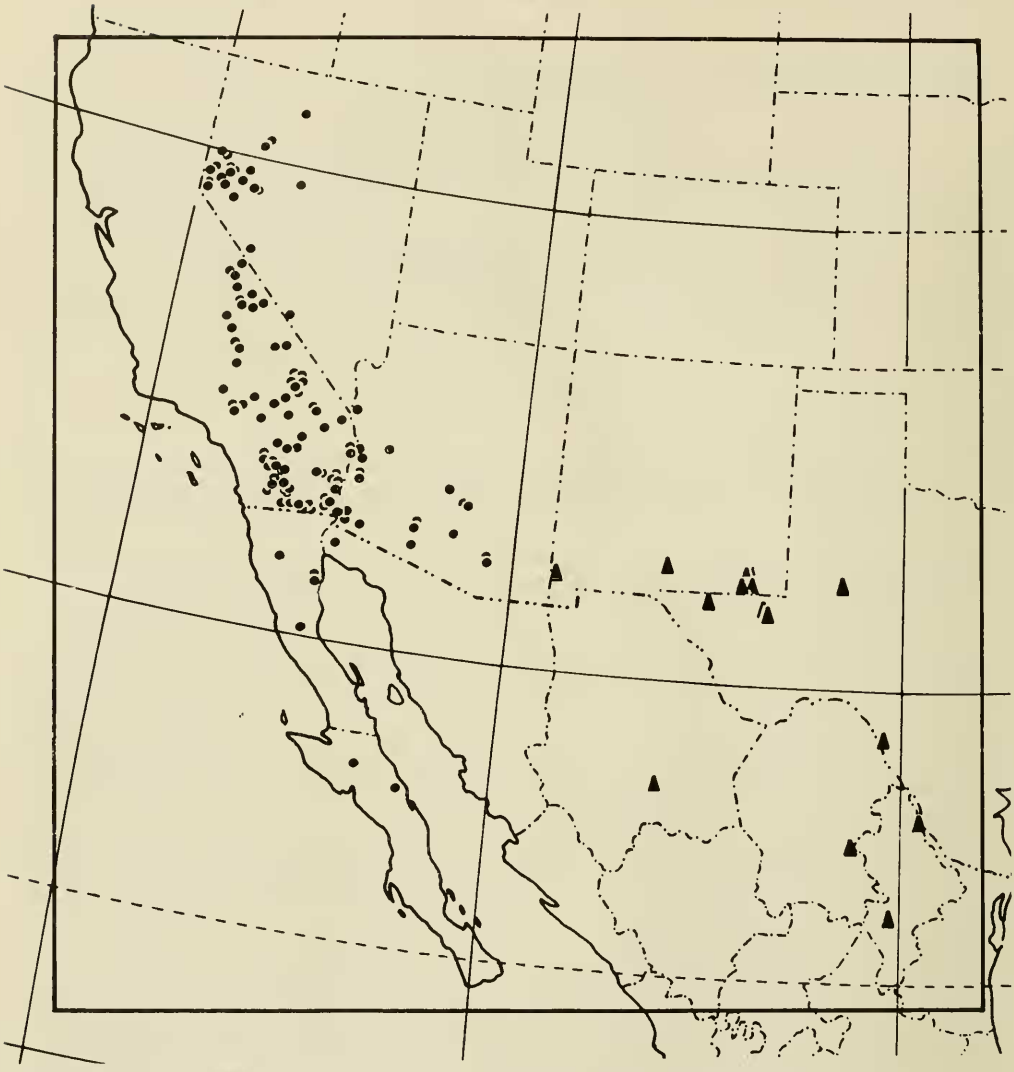

Fig. 15. Geographic distribution of *Pleuropasta mirabilis* (dots) and *P. reticulata* (triangles).

Co. Alamo Lake State Park; Ligurta; Martinez Lake, 1 mi. SE; Parker, 8 mi. SE; Quartzsite, & 9 mi. S; Wellton; Yuma. CALIFORNIA. *Imperial Co.* Bard; Bonds Corner, 4.7 mi. E; Calexico, 14 mi. E; Glamis, 3.5, 17 mi. NW, 10, 12.2 mi. W; Gordons Well; Harpers Well; Holtville; Holtville Airstrip; Kane Springs, & 2 mi. N; Palo Verde, & 3 mi. N; Plaster City, 2.5 mi. N; Seeley; Signal Mtn., at base of; Superstition Mtn.; Truckhaven. *Inyo Co.* Big Pine, & 4, 12 mi. S, 2 mi. E; Bishop; Death Valley National Monument (Jct. Hwy. 178 & Saratoga Springs Rd.); Deep Springs; Deep Springs College, 5 mi. S; Eureka Valley; Eureka Valley Dunes; Little Lake; Lone Pine, & 11 mi. W; Olancha; Solsberry Pass. *Kern Co.* China Lake; Indian Wells; Mojave. *Los Angeles Co.* Alpine Buttes; Black Butte; Lovejoy Buttes; Palmdale; Pearblossom, 5 mi. NNE. *Mono Co.* Benton Hot Springs; Paradise Camp; Toms Place. *Riverside Co.* Blythe, 15, 19, 40 mi. W; Cathedral City; Desert Center, 3 mi. NE, 33 mi. E; Desert Hot Springs; Hopkins

Table 4. Seasonal distribution and its geographic variation in *Pleuropasta mirabilis* with frequencies expressed as monthly percentages of total records.

Area	Month[1]									Total records
	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	
I. S of 34°N	13.4	62.2	18.3	1.2	0	0	0	3.7	1.2	82
II. 34°N–36°N	5.3	36.8	47.4	5.3	0	0	5.3	0	0	38
III. N of 36°N	0	0	19.6	45.1	29.4	3.9	2.0	0	0	51

[1] Populations in Area I more common prior to 1 May; those in Area II more common after this date ($\chi^2 = 12.81$; $P < .005$). Populations in Area III more common after 1 June; those in Area II more common before this date ($\chi^2 = 42.52$; $P < .001$).

Well; Indian Wells; Indio, & 6 mi. W; Mecca, 6 mi. W; Morongo Wash; Mule Mts. (Hodgkins Mine); Oasis; Painted Cyn.; Palm Springs, & 2 mi. N, 2 mi. W; Palm Springs Station; Pushwalla Palms; Ripley, 7 mi.; San Andreas Cyn.; Thousand Palms Oasis; Whitewater. *San Bernardino Co.* Amboy Lava Flow; Apple Valley; Baker, 5 mi. N, 23 mi. SW; Cronise Lake, & 2 mi. S; Essex; Goffs, 2.3 mi. N; Kelso, & 2.5 mi. S; Kramer Hills; Ludlow; Manix, 22 mi. N; Morongo Valley; Sheep Creek; Silverlake; Twentynine Palms; Victorville; Vidal Jct., & 5 mi. N; Yermo; Zzyzx Springs, dunes S of. *San Diego Co.* Blair Valley; Borrego Springs, 3 mi. E; Borrego Valley; Ocotillo. NEVADA. *Churchill Co.* Fallon, 23 mi. E; Frenchman, 9 mi. W (Sand Mtn.); Stillwater, 12 mi. NE. *Humboldt Co.* Golconda, 3 mi. N; Soldier Meadows (not located). *Lander Co.* Austin. *Lyon Co.* Dayton, 16 mi. NE; Fernley, & 5 mi. E; Fort Churchill; Yerington. *Mineral Co.* Basalt. *Nye Co.* Lathrop Wells, 9.4 mi. NW. *Ormsby Co.* Carson City. *Pershing Co.* Lovelock; Woolsey. *Storey Co.* Reno. *Washoe Co.* Mustang; Nixon; Patrick; Pyramid Lake; Wadsworth, & 2.8 mi. W; Washoe Lake, 1 mi. E.

Pleuropasta reticulata Van Dyke

Calospasta mirabilis: Champion, 1892: 393 (in part, incl. Coahuila rec. & Fig.).
Pleurospasta mirabilis reticulata Van Dyke, 1947: 158.
Pleurospasta reticulata: Vaurie, 1950: 56. Werner et al., 1966: 27.
Pleuropasta mirabilis: Dillon, 1952: 376 (in part, incl. TX rec.).
Pleuropasta reticulata: Cohen and Pinto, 1977: 742.

Type information.—Holotype, from Loving, New Mexico, in the collection of the California Academy of Sciences.

Geographic distribution.—Figure 15. Occurs in the Chihuahuan Desert from southern New Mexico to southern Chihuahua, Coahuila and Nuevo Leon.

Seasonal distribution.—15 April (Pecos, TX)—21 September (5 mi. N Carlsbad, NM). Frequency by month for 20 records as follows: April—1, May—3, June—4, July—2, August—8, September—2. Seasonal extremes are known from the same general area; no geographic variation in season of adult activity is yet apparent.

Adult host.—Collected on *Coldenia canescens* DC. and *Coldenia* sp. at several sites. I observed a large population feeding on flowers of *C. canescens* in Hidalgo Co., NM.

Records.—MEXICO: CHIHUAHUA: Hidalgo de Parral, 33 mi. N. *Coahuila.* Cuesta La Muralla (on Hwy. 57). NUEVO LEON. Villa de Garcia, 8 km. SE.

TAMAULIPAS. Nuevo Laredo. UNITED STATES: NEW MEXICO. *Eddy Co.* Carlsbad, 1, 5 mi. N; Loving; Whites City. *Hidalgo Co.* Granite Gap, 1 mi. N; Rodeo, 18 mi. N. *Otero Co.* Valmont, 9 mi. S. TEXAS. *Howard Co.* Big Spring. *Hudspeth Co.* Salt Flat, 5 mi. N. *Maverick Co.* Eagle Pass. *Reeves Co.* Pecos, & 11 mi. N.

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